

# looking ahead

A monthly report by the National Planning Association on forward looking policy planning and research—announced, underway, and completed—of importance to the nation's future

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## The Promise of Solar Energy

by William H. Stead

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IN AN INCREASINGLY energy conscious world all nations are turning their eyes toward hopeful new energy sources. Nuclear energy is appropriately receiving the major share of attention, but interest is also growing with respect to the potentialities of solar energy. Not only are the future potentialities of solar energy of world-wide importance, but the time appears ripe to push for a major international program of intensified research and development which could be of great significance in the economically underdeveloped sections of the earth.

Almost all of the underdeveloped nations are in the solar belt, which extends from the equator beyond the tropics to approximately the 40th latitudes north and south, and comprises the vast area of the earth's surface within which utilization of solar energy will be most effective, although temperate zone and even arctic uses are technically, if not yet economically, feasible.

What are the reasons for thinking that solar energy, long known and studied but little used, will be ready for extensive practical application in the near future? They are well summarized in the 96 papers of the "Conference on Solar Energy—The Scientific Basis," held at Tucson, Arizona, October 31 - November 2, 1955, and the Proceedings of the World Symposium on Applied Solar Energy at Phoenix, Arizona, November 2 - 5, 1955. These conferences were held under the joint sponsorship of Stanford Research Institute, the University of Arizona, and the newly created Association for Applied Solar Energy. The views of scientists briefly cited here are from these papers and proceedings.

Stanford Research Institute recently (1955) published for the Association for Applied Solar Energy an excellent "Directory of

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*the people of NPA*

### Goals of Cooperation

"The will to peace with freedom calls for the development of teamwork in dealing with day-to-day problems. Teamwork is based on an atmosphere in which men know, respect and have confidence in one another..."

- "We of business recognize that the major objective of management is to operate in the public interest..."

- "We of labor believe that the basis of America's economy should be private enterprise, with private business and industry and agriculture operating as the primary means and providing jobs and producing goods and services..."

- "We of agriculture in turn recognize that agriculture, business, and labor are mutually dependent on each other..."

"Our job is to weld a new framework of human relations on broad and cooperative lines."

*From a joint statement by the board and agriculture, business, labor, and international standing committee members of NPA, unanimously adopted, December 1946.*



World Activities and Bibliography of Significant Literature on Applied Solar Energy Research." This volume lists some 73 research centers engaged in applied solar energy research in the United States (7 government, 35 private or industrial research units, 31 universities) and 64 in other countries, 46 of them in 19 "solar belt" countries.

The status of solar energy research and its possible application can be very briefly summarized under four headings: Use of solar heat energy (photo-thermal), conversion of solar energy into electricity (photo-electric), chemical uses of solar energy (photo-chemical), and improved biological uses of solar energy (photo-synthesis, properly a division of photo-chemical).

OF THESE FOUR USES of solar energy, the effort to utilize solar heat energy (photo-thermal) has received most attention, although the other uses (photo-electric and photo-chemical, including photo-synthesis) may have the greatest potential value. There are three types of direct uses of solar heat energy:

First, low temperature conversion processes (with flat plate collectors), used for operating some solar pumps and engines, for water heaters, for house heating, house cooling, refrigeration, and for solar stills to convert saline to fresh water.

It is in these many low temperature (below the point of boiling water) heat-using devices that the uses of solar heat are most promising. Solar water heaters have been very effective. Many have been developed in the U.S. (some 20,000 are in use in Florida), and France, India, U.S.S.R., U.K., Malaya, Israel, Australia, and South Africa have likewise developed water heaters.

In the United States the greatest interest in the application of solar heat energy has been in the heating and cooling of homes. Several experimental solar heated (and some cooled) houses have been constructed in different parts of the U.S. So far they are technically successful but expensive.

The most extensive use of solar energy for house heating (and cooling) is in connection with the installation of heat pumps. Some 4,000 to 5,000 heat pumps have been installed in U.S. homes, mostly in the southern half of the country. In addition to heating, they provide summer cooling possibilities. In U.S. latitudes, these installations furnish only about three-fourths of the heating required and need

to be supplemented.

Solar stills to convert saline water to usable fresh water, and incidentally to secure certain mineral salts, have great interest for scientists in arid countries.

Technically, such stills have long been feasible but they have not been too efficient or economical. However, Dr. Maria Telkes of New York University believes that even now the cost of solar still water is lower than the cost of water precariously transported over long distances, or obtained by fuel operated stills in tropical regions. She is working on a 10-phase distillation device which would greatly increase the production of water and reduce the cost to close to competitive levels.

One great advantage of all of these solar heat devices, at whatever heat range, is that the source of energy is at the point of use; there is no need for a central power producing station or for a distribution system.

At temperatures up to 1,000° Centigrade, secured by concentrating collectors, heat is transmitted directly to steam generators, cookers, and low temperature furnaces.

If we choose the solar cooker or solar stove as an illustration of the middle temperature range, secured by concentrating collectors, we can see some of the unique advantages of solar heat devices in these underdeveloped countries.

The simplicity of the solar cooker is its great virtue. Dr. Maria Telkes has used four flat mirrors to direct the sun's rays into an oven that achieves a temperature of 350° F. In a recent letter, Dr. Telkes comments as follows: "Some of our solar oven models achieved a temperature of 470°F, even if only plane reflectors were used to concentrate solar energy. This temperature is too high for cooking; 400° to 425°F is the culinary 'hot' oven; while 350° to 375°F is 'moderate.' Such temperatures can be maintained easily by our ovens."

Many models of a simple solar cooker have been successfully constructed so that the collecting surfaces concentrate the sun's rays on a spit or a cooking vessel. Many of them are the shape of an inverted umbrella. The Indian Government has been intensely interested in these cookers and is now producing one in large numbers at a cost of approximately \$15.00. Dr. Telkes has recently developed a practical solar cooker at a cost of between 5 and 6 dollars. Mass production would reduce this cost.

It is true that you can only cook when the sun is shining, but if you have had no stove and

the only fuel available is animal dung, this is not a major disadvantage. Indian Government officials have estimated that there is a potential market for 100 million solar cookers.

Finally, ultra-high temperatures, between 1,000° and 3,500° Centigrade, secured through special parabolic concentrators or lens-focusing collectors, operate industrial furnaces requiring clean heat at extremely high temperatures for research and industrial purposes.

Such high temperature solar furnaces have been in successful use in the U.S., France, Algiers, Germany, U.S.S.R., India, and Japan.

The U.S. Air Force is undertaking to build a solar furnace in New Mexico which will achieve temperatures of 7,000° to 8,000° Fahrenheit to test the heat-withstanding capacities of materials and weapon components. Particularly in the arid sections within the solar belt, these industrial furnaces can supply a use of energy not now available.

**T**HE SECOND POTENTIAL use of solar energy is to create electricity (photo-electric). We have mentioned a limited possibility of producing electricity from small generators fueled by solar heat. A much greater potential exists in the recent work of a number of university and industrial laboratories in developing photo-voltaic materials capable of converting a rather small percentage of solar energy directly into electricity. These converters are called solar batteries. The best known is the one developed by the Bell Research Laboratories (a photo cell utilizing silicon wafers), which is being used in Georgia to supply about 50 watts of power to a rural telephone system.

Other methods of direct derivation of electricity from solar energy are being studied with high prospects of useful results. Solar-derived electricity will never be available in large concentrations for wide distribution. It will be in the form of small battery-type units, but it may well be suited to the needs of those nations with scattered, non-urban populations and limited industrial and commercial demands.

Photo-chemistry is in its early research stages, but the scientists in the field believe its potential is enormous. Dr. Farrington Daniels of the University of Wisconsin points out that the primary present research goal in photo-chemistry is to find a suitable reaction which can be produced by sunlight with the absorption of energy, and then allowed to reverse itself at will in the dark with the evol-

ution of energy.

The great difficulty with all of the solar heating or cooling devices which use flat plate collectors, is the storage of solar energy for use at night and at other times when the sun is not shining. Various methods (including tanks of water or other liquids and pebble beds or bins) have taken care of heat storage over night or for short periods with some success, but this remains one of the major problems.

Massachusetts Institute of Technology and some other solar research laboratories have been doing research on converting solar to chemical energy with encouraging results.

Photo-synthesis is, of course, a photo-chemical process, but we have stressed it separately here because of its tremendous implications with respect to food production, perhaps the basic problem of the underdeveloped nations of the earth. Much attention has been given to the possibilities of mass production of algae as a source of food as well as fuel. Certain algae can be grown more rapidly than ordinary crops. Chlorella is one of the 18,000-odd species of algae which appears to be suitable for large-scale culture. It has been studied both on a laboratory and on an engineering scale in the U.S., France, Japan, Israel, and other nations.

There are some who believe that chlorella fields could, perhaps, supply most of the food to the vastly increased populations of the future. It is expected that the result could be twenty tons of protein and three tons of fat per acre per year. This far exceeds the present production quotient of land plants.

Important as this can be in the future, the possibilities of large improvements in photo-synthetic processes in plants now marketed extensively for foods are more immediate and more exciting. Dr. P. C. Mangelsdorf, in charge of the Cabot Fund for solar energy research on plants at Harvard, suggests that of the 3,000 plant species used for food (150 of them in international commerce), only 12 now serve as the major food sources, and improvements in them would mean great strides in increasing food production.

The efficiency of the higher plants in using solar energy is potentially about as high as that of algae, but growing conditions usually prevent the potentials from being realized. Many of these difficulties can be resolved through research.

**T**HE EFFECTIVE utilization of solar energy is just beginning. Much basic and applied



research is necessary before major results can be secured, but we now know enough to see some of the directions the research must take and the potential value of this development.

The writer believes that solar energy research and development should now receive important emphasis in the United States in cooperation with the scientists of the underdeveloped countries where it can mean much in meeting their needs for food, water, and energy.

### The UNESCO Courier

IT IS DIFFICULT to describe an interesting publication—how would you describe the "New Yorker," for example, to someone who had never seen it?—but this UNESCO publication deserves a notice. "The UNESCO Courier" is a 34-page illustrated magazine published monthly by the Department of Mass Communication of the United Nations Educational, Scientific and Cultural Organization, which reports on the latest world developments in these three fields.

In July 1956, a typical issue, the Courier reports on UNESCO's latest survey on world communications, which "Looking Ahead" reviewed last month. An experiment carried out in France through the cooperation of UNESCO, French television, and rural tele-clubs shows how TV can now be used to develop popular culture and adult education campaigns on a vast scale. A UNESCO poll reveals French likes and dislikes in television.

A rag doll, a wooden horse and spoon, and a papyrus rosette belonging to a little boy named Theon were among the 2000-year-old relics reported unearthed in Egypt. The rhyming Cockney slang, where "trouble and strife" means "wife," is described as London's own language. Pictures of Yugoslav art masterpieces show the influence of both Eastern and Western civilizations in the development of art in that country.

"The Educated Man in 1984," by Dr. J. Bronowski, whose views on this subject were noted in the April 1956 issue of "Looking Ahead," was a special feature. A picture section each month shows UNESCO's work in various countries throughout the world.

("The UNESCO Courier." From: UNESCO Publications Center, 475 Fifth Avenue, New York. 25¢ or \$2.50 per year.)

—the people of NPA—



Roy Stevens, Photo

Fred  
Lazarus, Jr.

Fred Lazarus, Jr., NPA trustee, is president of Federated Department Stores, Inc., with headquarters in Cincinnati and with divisions operating in Boston, New York, Brooklyn, Columbus, Cincinnati, Milwaukee, Dallas, Houston and Miami. Born in Columbus, Mr. Lazarus attended Ohio State University and began his career with F. & R. Lazarus and Company, where he is now chairman of the board. In 1950, he was awarded the seventh annual Tobe prize for his distinguished contributions to American retailing. Mr. Lazarus is a member of the President's Committee on Government Contracts, and during World War II served on the advisory council of the Office of Civilian Requirements. He is a member of the executive committees of the American Retail Federation, the American Jewish Committee and the Citizen's Development Committee of Cincinnati. Mr. Lazarus is on the boards of the American Red Cross, the Committee for Economic Development, the Eisenhower Exchange Fellowships, the Hebrew Union College, and the Bellefaire Home for Children, Cleveland. He is a member of the business advisory council of the Department of Commerce, the National Council of Junior Achievement, Inc., and the U.S. Council of the Chamber of Commerce. Mr. Lazarus was the organizer and past president of the Ohio Council of Retail Merchants.

## Urban Regional Planning

A CITY 600 MILES LONG and with a population of 34,000,000 people is difficult to imagine--staggering figures indeed. But that part of the eastern seaboard that stretches from Portland, Maine, to Norfolk, Virginia, where the settlement pattern is marked by practically contiguous metropolitan areas, forms what may be called an "urban region."

Urban regional planning is fast becoming one of the great problems requiring the nation's attention. Urban congestion and the need for slum clearance are common in every large city. The metropolitan center today is, in reality, only one large regional center in a mass of mutually dependent ones. Between 1950 and 1955, 97 percent of the estimated national population increase occurred in standard metropolitan areas. It is impossible to deny the fact any longer that the American population is urbanized, even though some of it lives on farms.

Although an urban region cannot be called a "city," in the accepted meaning of the word, the 600-mile stretch from Maine to Virginia is a kind of diversified great community. The largest urban region in the world, with such cities as Portland, Boston, New York, Philadelphia, Baltimore, and Washington, it was, and is, the nerve center of the United States, and is now one of the world's greatest power centers. The only other remotely similar area in the world is the North Atlantic European area. There are, of course, other urban regions of varying sizes and populations, notably around Cleveland and Detroit, from Chicago to Milwaukee, Los Angeles to San Diego (and possibly sometime in the future from San Francisco to San Diego), and from Miami to Palm Beach in Florida.

In the urban region, the distinctions between towns, suburbs, and country are disappearing. The old pattern of clustering around a central city is on its way out. Whole new zones of population are being created in the suburbs, and in the suburbs of the suburbs. Even manufacturing is moving out of the cities. In this new era of commuting, the central city is becoming an obstacle.

What, then, is the direction that planning should take in an urban region? Christopher Tunnard, director of the graduate program in

City Planning at Yale University, suggests the following approach:

- First, good local planning should consider the position of each community in the hierarchy of places which make up the region. If a city's place in the region is determined, its reason for "being," it is possible to predict its future. Today's smaller cities may look forward to further growth and importance because of their strategic place within the region.
- Second, the economic importance of specialized communities to the region must be realized. Specialized towns, like Hartford, a leader in the insurance business, or towns which make only chocolate bars, like Hershey, Pennsylvania, may be in a dangerous economic position in a system of every town for itself, but in a regional context such specialization has a definite logic.
- Third, transportation and recreational facilities must be planned on a strongly regional basis and not just from city to city, as highways often are now. One eastern railroad, for example, has new commuter stations half-way between big city stops. New recreational areas will be needed within easy reach of everyone.
- Fourth, a recognition by local government of the concept of regionalism is required. (Some of the nation's best legal minds are already working on this problem.) While cities and towns within a region will still maintain their own governments, something new, like a metropolitan council, may be needed. Under such a system, a town might come to have a status similar to that of a borough, with the big cities broken up into similar boroughs, each with their elected officials. The shifting of tax burdens and redistribution of revenue on a regional basis may occur. Although no detailed machinery has yet been suggested, New York officials can already be heard calling for "a new type of local federalism across state lines" or a "joint interstate metropolitan government development commission" to solve their problems of transportation, water supply, and pollution control.

Through urban regional planning, great strides can be taken to eliminate the current problems of blight, slum clearance, overspill

and congestion that in themselves result from the very nature of the present urban region. With regional planning, it will be possible to properly relate the smaller centers to the larger ones, and at the same time preserve their individuality within the greater regional whole. ("The Landscape of the Big Street," by Christopher Tunnard, in "The Listener," July 26, 1956. From: British Broadcasting Corporation, London. 10¢)

## On Tariff

IN A STATEMENT submitted last month to a House Ways and Means subcommittee, J. D. Zellerbach, Chairman of the Board of the Committee for Economic Development, urged gradual and selective tariff reductions. The statement, which expressed the views of CED's Research and Policy Committee on tariff policy, makes clear, however, that the Committee does not favor unlimited free trade.

The Committee, Mr. Zellerbach explained, "believes that the expanding American economy will be better able to maintain its dynamic forward movement in a climate of trade liberalization than in a climate of trade restrictions. Simultaneously, our expanding economy will tend to absorb those adverse effects of trade liberalization which may be felt in particular segments of domestic industry." He noted that in carrying out such a program, it is in the national interest to follow a policy which would "be fair to those who may suffer hardship from tariff reduction" and which would "not damage domestic production that is truly essential to national security."

Mr. Zellerbach, who is also a member of the board of trustees of NPA, is President of Crown Zellerbach Corporation, San Francisco. (From: Committee on Economic Development, 444 Madison Avenue, New York 22, N.Y.)

## CED President

Alfred C. Neal, first vice president of the Federal Reserve Bank of Boston, was appointed in September to the newly created post of president of the Committee for Economic Development. An adviser on economic development problems and a well-known speaker on economic topics, Mr. Neal served on the Research Advisory Committee of the NPA Committee of New England, which reported on The Economic State of New England.

## International Geophysical Year

TO UNLOCK THE SECRETS of nature, the earth, its seas, and sky is the cooperative goal of 5,000 scientists from 46 nations who will participate in the International Geophysical Year, nicknamed "Iggy," scheduled for 1957-58.

The year beginning July 1, 1957 has been chosen because it is a year with nearly sun-spot maximum and will facilitate the study of solar effects on the earth. Twice before, in 1882-83 and 1932-33, scientists have participated in an International Polar Year, but the new plan is on a vastly larger scale. The total cost of the program is estimated at about \$42 million, and its long-range objective is to provide a better understanding of climatic variations.

The areas under investigation include meteorology, the study of aurora and airglow (self-luminescence of upper atmospheric gases), geomagnetism, ionospherics, ozone, cosmic rays, glaciology, solar activity, variation in longitude and latitude, seismology and oceanography, to name a few.

Man-made satellites will be launched by means of three-stage rockets and will circle the earth at a height of 200 miles, providing information necessary for improved weather forecasting. Rockets equipped with recording devices and balloons carrying equipment, and observers who will later parachute to safety, will also be utilized in gathering information hitherto unknown about the upper regions of the atmosphere.

Although the program will be world-wide, with chains of stations from pole to pole, the exploration of Antarctica is a major part of the scheme. More than 40 stations are being set up there, three of which will be at the geographic pole, the geomagnetic pole, and the Pole of Inaccessibility, respectively. A trans-Antarctic expedition, under the leadership of England's Dr. V.E. Fuchs, will cross the continent from west to east, mapping and doing survey work, as well as taking seismic soundings of the ice depth, together with a continuous gravity traverse as it makes its way across. The 2,000-mile trek from Weddell Sea to Ross Sea across the South Pole has been called the one really great adventure left to man.

Every phase of the program will yield vital information affecting the lives of people everywhere. Each study, particularly those in the Antarctic, will result in data never before



available. International coordination of the technical information is under the direction of a special committee of the International Council of Scientific Unions.

Task forces already in Antarctica are changing the face of the map as small towns spring up all over the continent. Crews in the Falkland Islands and New Zealand are making preparations for the program. Direct American flights from New Zealand to Antarctica are in operation, and the Russians, who are in regular wireless touch with Moscow, plan a supply route direct from the U.S.S.R. by air.

Who can predict the outcome of this tremendous undertaking? The future may see flights to the moon become a reality. Antarctica may become colonized and inhabited, and information that will add to the comfort of our everyday life may result. The quantity and quality of the vast amount of technical data gathered during this cooperative scientific effort may make some of man's wildest dreams come true.

(From: Various issues of "Science News Letter," and "The Listener," August 30, 1956.)

### Needed for Public Service

The U.S. Department of State has asked the cooperation of professional associations, research foundations, colleges and universities in securing personnel to complete its current expansion program. The Department points out that while most of the recruitment will be accomplished through competitive examinations, there also are openings at higher levels for officers with specialized training and experience. At these higher levels, the most pressing need is for economists, and language and area specialists in the Far East, Middle East, Eastern Europe, and Africa. Salaries range from \$5,100 to \$10,600, with additional cost-of-living and other allowances for officers in foreign posts. The positions are described as follows:

**INTERNATIONAL ECONOMISTS** with practical experience to assist in the formulation of policy in the fields of international trade, economic development of underdeveloped areas, economic defense, restrictive business practices affecting American interests abroad, and international monetary matters.

**INTELLIGENCE RESEARCH SPECIALISTS** to assemble, evaluate, analyze and interpret information on the economic, political,

social and cultural condition, trends and forces in foreign areas which may affect foreign policy or national security.

Initial application may be made by forwarding a resume of background and experience to the Employment Division, Department of State, Washington 25, D.C.

### International Management Council

**M**ORE THAN 1200 management representatives from Europe, Latin America, and Asia, have come to the United States since 1950 to study the "how" and the "why" of American management. In the last five years, over 100 men, composing 34 teams, have held management seminars throughout these same areas, giving executives in other countries an opportunity to meet with small groups of American management leaders, to exchange views and discuss common problems.

These projects, and many more, were made possible by the Council for International Progress in Management (CIPM), founded in 1933 by a group of leading American management associations for the purpose of giving them official international representation. With its membership now including leading corporations and industrial firms, it is the only American management organization operating exclusively in the international field.

A member of the Comité International de l'Organisation Scientifique (CIOS), which represents the organized management societies of 27 countries in Europe, the Western Hemisphere, the Far East and Australia, the CIPM, in addition to its role as representative of American management at international conferences, plays an active and important part in implementing our own government's Technical Assistance Program.

The CIPM is a founding member of the Pan American Council of CIOS (PACCIOS), which has affiliates in Canada, Brazil, Chile, Argentina, and Mexico. American participation in the first Inter-American Management Conference, scheduled for November 2 - 17, 1956 in Santiago, Chile, is being organized by CIPM.

The representatives of other countries who have come to the United States to study American management have been more concerned with learning more about the general climate in which American management operates and the basic principles and practices that have

established this climate rather than the study of particular industrial processes.

The results of CIPM seminars of American executives with their counterparts in other countries, although hard to measure, are becoming increasingly evident: A Turkish production manager, for example, now knows more about the meaning of preventive maintenance. Belgium industrialists, who in 1952 found that sitting down together to discuss their management problems benefited their businesses, are now engaged in a productivity program that they describe as "a sound framework for the development of management ideas in Europe."

The CIPM has had three management experts serving as industrial consultants in Finland for the last year and a half. The project is financed by groups in the United States and Finland interested in the industrial development of that country.

A research report on how to develop more good managers overseas is one of CIPM's current projects. The CIPM feels that if it can reach the present and future managers and industrial leaders in countries of the free world and help them achieve productive and beneficial management in their enterprises, it will be making an important contribution to stabilized economic conditions throughout the world. (CIPM Reports, in "Advanced Management," October 1956. From: The Society for the Advancement of Management, New York. 75¢)

## Lectures on Latin America

A SERIES of lectures on economic development in Latin America was delivered by Theodore W. Schultz, Chairman of the Department of Economics at the University of Chicago and NPA board of trustees member, at Cornell University in March 1956. Recently published by the New York State School of Industrial and Labor Relations, the lectures, made possible by a grant from the Sidney Hillman Foundation, were based on the NPA studies of technical cooperation in Latin America, which Mr. Schultz directed. ("The Economic Test in Latin America," by Theodore W. Schultz. From: Distribution Center, Cornell University, Ithaca, N. Y. August 1956. 25¢)

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